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TRADE POLICY AND WELFARE IN SEGMENTED MARKETS

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Abstract: This paper develops a model of a segmented oligopoly market for a small open economy to analyse trade policies in developing countries. In contrast to the standard market segmentation model we assume firms face an infinitely elastic foreign demand while the domestic market is imperfectly competitive and segmented. In a stable equilibrium in such a market all scale economies are fully exploited and all firms who export sell the same amount in the domestic market so that the more efficient firm exports more. We then examine the relative effects of a policy favouring entry and of a policy of export subsidization on the volume of exports and welfare of an economy. We demonstrate that liberalizing entry is more effective in export promotion than export subsidization as it is likely to have an accelerating effect on exports whereas subsidies are likely to have a decelerating effect. Also, for the same increase in exports entry raises government expenditure less than a higher subsidy rate—an important consideration for developing countries with fiscal problems. Furthermore, for the same increase in exports welfare is higher if the increase in exports is achieved through entry than if it is achieved through subsidies.

INTRODUCTION

Recent developments in policy oriented trade theory which assume that a country has market power in an oligopolistic world market (See, Brander and Spencer, 1985) have important policy implications for developed economies. Analysts have examined how such monopolistic power can be exploited to extract rent (Krugman, 1989) or the optimal policy choice for a country having monopoly power in both the domestic and the world market (Auquier and Caves (1979) or the options for oligopolistic firms operating in internationally segmented markets (Smith and Venables, 1988). However, these models are not quite relevant for most of the developing countries since these countries are often characterized by their price taking behaviour in the world market. In this paper therefore we attempt to formulate a model relevant for analysing policy choices of developing countries. In particular, we shall be dealing with the question of relative efficacies of trade policies for an open developing economy.

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The failure of the import substitution strategy of development (See, Bhagwati, 1978, Little, Scitovsky, and Scott, 1970, Choksi and Papageorgiou, 1986) has resulted in gradual changes in the trade and industrial policies of developing countries. The changes that come under the general head of liberalization take various forms such as providing subsidies for exports, duty free imports for exports, encouraging competitiveness through reducing protection against imports etc. Such external liberalization policies have often not yielded the desired results perhaps because those policies only attempted to remove a few of the many existing distortions in the economy. Empirical studies based on the experience of developing countries do not provide any unambiguous result regarding the effects of liberalization (Rodrik, 1988; Srinivasan, 1990). In particular, external liberalization policies are often carried out without liberalizing the *internal domestic industrial structure*. An important feature of industrial policies in many countries is government control of entry through licensing.

We use our model of a domestically segmented oligopoly market in an open economy to analyze the effect on exports and on welfare of a policy of internal liberalization as against that of subsidizing exports. We show that internal liberalization defined as allowing entry into the market, where such entry is controlled by the government, is preferable to external liberalization.

The paper is organized as follows. In section I.1 we develop a general oligopoly model for a small developing economy to analyse the positive effects of subsidies and freer entry on exports. From the first order profit maximization condition we derive an important result that all discriminating oligopolistic firms that export have the same share of the domestic market irrespective of the cost conditions of the firms. As a corollary to this result a more efficient firm will export a relatively higher proportion of its output. From the second order conditions for profit maximization we derive the result that all prevalent economies of scale will be exploited as the equilibrium takes place on the rising segment of the marginal cost curve (section I.2). In section II we show that while each of the two policies of increasing the rate of subsidy and allowing entry lead to more exports, entry is likely to have an accelerating effect on exports but subsidy is likely to have a diminishing effect. In section III we compare subsidy and entry policies from the view point of the government budget. We show that the cost of providing subsidy will be greater for a particular increase in exports if the government chooses to increase subsidies than if it chooses to enourage entry. A subsidy would therefore be inferior if the govenment is attempting to control expenditure in order to reduce a fiscal deficit- an important current problem in many developing countries- or if raising revenues to meet the higher subsidy expenditure leads to distortions elsewhere in the economy. In section IV we compare the welfare effects of the two policies in a general equilibrium framework and show that entry is preferable. And finally in section V we discuss the major conclusions of our paper.

I

I.1. *An Open Economy Oligopoly Model*

We assume that the inverse demand function for the domestic market is given by,

$$P = f(Q_d) \tag{1}$$

where P is domestic price and Q_d is the quantity demanded. Suppose the domestic market is segregated by imposing an *ad valorem* tariff or quota which prevents imports of that commodity. If P^* is the given world price and s is the *ad valorem* rate of subsidy for exports to each of N oligopolistic firms then the profit to be maximized by the i^{th} firm can be written as:

$$\Pi^i = f(Q_d)q_d^i + P^*(1+s)q_f^i - C^i(x^i) \tag{2}$$

where Π^i is the profit of the i^{th} firm, q_d^i and q_f^i are the firm's domestic and exports sales and $C^i(x^i)$ is the cost function where $x^i(=q_d^i+q_f^i)$ is the firm's total output.

Maximization of (2) w.r.t q_d^i and q_f^i yields the following first order conditions of profit maximization

$$\partial\pi/\partial q_d^i = [f(Q_d) + q_d^i f'(Q_d)] - C^{i'}(x^i) = 0 \tag{3}$$

$$\partial\pi/\partial q_f^i = P^*(1+s) - C^{i'}(x^i) = 0 \tag{4}$$

We assume zero conjectural variations to derive the above conditions. However, non-zero conjectures do not change the results fundamentally.[1] From conditions (3) and (4) it is clear that for any pair i, j of firms which export, each firm will have the same share in the domestic market, that is, $q_d^i = q_d^i$ even when the cost functions are different. This result is in contrast to the conventional result of oligopoly equilibrium in a closed economy where the more efficient firm has a larger share in the domestic market. Furthermore, when firms vary in efficiency namely, if $dC^i(x^i)/dx^i \gtreqless dC^j(x^j)/dx^j$ then $x^j \gtreqless x^j$, i.e., the more efficient firm produces a larger output.[2] Since both firms sell equal amounts in the domestic market the more efficient firm exports a larger amount. Firm efficiency is therefore translated into higher export performance, and derive the following important result:

[1] Seade (1980) had generalized the Ruffin analysis of entry in a closed economy for the case of non zero conjectural variation, and in the condition N was then replaced by N/λ where λ is the common conjectural variation. For a general analysis of entry in oligopolistic markets with trade see Agarwal and Barua (1994).

[2] Suppose the i^{th} firm is more efficient so that $dC^i(x^i)/dx^i < dC^j(x^j)/dx^j$. Since each firm in equilibrium will equate its marginal cost to the given foreign price, P^*, the output at which $dC^i/dx^i = P^*$ for the i^{th} firm must be *higher* than the output at which $dC^j(x^j)/dx^j = P^*$ for the j^{th} firm. Thus $x^i > x^j$.

RESULT 1. *Regardless of the cost conditions each discriminating firm that exports will sell the same amount in the domestic market. The more efficient firm will export a higher proportion of its output.*

I.2. *The Symmetric Equilibrium Case*

If, however, firms have identical cost functions then the equilibrium is symmetric, namely, for all i, $x^i = x$, $q_d^i = q_d$, $q_f^i = q_f$ and $C^i(x^i) = C(x)$. Then, if X, Q_d and Q_f are the aggregate output, domestic demand and exports respectively we can write for any number of firms N

$$X = Nx\,, \quad Q_d = Nq_d \quad \text{and} \quad Q_f = Nq_f$$

The sufficient second-order profit maximization conditions are

$$\partial^2 \Pi / \partial q_d^2 = [2f'(Q_d) + q_d f''(Q_d)] - C''(x) < 0 \tag{5}$$

$$\partial^2 \Pi / \partial q_f^2 = -C''(x) < 0 \tag{6}$$

and the Hessian $H > 0$ which implies

$$-[q_d f''(Q_d) + 2f'(Q_d) - C''(x)] > C''(x) \tag{7}$$

It follows from (6) that $C''(x) > 0$ which means that the equilibrium of the firm would take place on the rising part of the marginal cost curve so that *any prevalent scale economies have already been fully utilized.* Since $C''(x)$ could as well be negative in an oligopolistic equilibrium *without trade*, it is important to recognize the crucial difference between the close and the open economy oligopolistic equilibria.[3] Conditions (5) and (7) can be written as

$$E + N + Nk > 0 \tag{5'}$$

$$E + 2N > 0 \tag{7'}$$

respectively where $E = Q_d(f''/f')$, that is, the elasticity of the slope of the demand curve and $k = (1 - (C''/f'))$. Since $C'' > 0$ and $f' < 0$, k is positive and greater than unity, so that $E + N + Nk > E + 2N$ and the conditions (5') and (7') collapse into a single condition (7') which implies that $2f'(Q_d) + q_d f''(Q_d) - C''(x)$ not only be negative but its absolute value must be greater than the value of $C''(x)$. In the *closed economy case* C'' may be positive or negative so that k is unrestricted and an additional assumption that k is positive is needed to ensure stability (See, Seade, 1980). With k assumed to be positive, $(E + N) > 0$ is a necessary and sufficient condition for stability of equilibrium with entry (Ruffin, 1971; Seade, 1980). The elasticity of the slope of the demand curve, E, is inversely related to the curvature of $f(Q_d)$ and its sign depends on whether $f(Q_d)$ is concave or convex. E is negative

[3] Our analysis also implies that any constraint on *capacity output* would limit exports. In fact it is not appropriate to define licensed capacity in terms of output when the oligopolist is motivated to participate in world trade. Any change in the exchange rate would lead to a change in the output produced so as to ensure that $C'(x^i) = P^*$, and the output produced by the oligopolist is an increasing function of the subsidy or the exchange rate.

for a convex and positive for a concave demand curve. For a concave demand curve positive E implies that $f''<0$, so that the negativity of the slope of the demand curve is increasing.[4] E is zero for a straight line demand curve. Hence for a straight line or a concave demand curve $(E+N)$ is always positive. However, for *convex demand curve* with constant elasticity, it can be seen that $(E+N)$ would be positive for any possible oligopoly equilibrium if $\varepsilon > 1/(N-1)$ where ε is the *elasticity of demand* and N is the number of firms since the value of E for such a demand function is, $E=-((1+\varepsilon)/\varepsilon)$.

Interestingly, for the open economy case we do not have to impose any restrictions on the size of k as Seade does since the second-order condition (6) ensures that $k>1$. The Ruffin condition is sufficient for stability $(E+2N>0)$ but is not necessary. Thus we get the following result:

RESULT 2. *In contrast to the closed economy oligopoly model, the conditions for stability for a small open economy oligopoly equilibrium, under domestically segmented market hypothesis, are much weaker since the Ruffin condition is only sufficient but not necessary. Further, even if the technology of production displays economies of scale, they are irrelevant at the point of equilibrium because firms always produce on the upward rising part of the marginal cost curve.*

II. COMPARATIVE STATICS

In this section we examine the effects of certain policy changes. Initially, we study the effects of a subsidy on the exports of an individual firm as well as the industry.

II.1. *The Effects of Subsidy on Exports*

In order to determine the effects of increasing the subsidy on exports for a given number of firms, N, we differentiate totally (3) and (4) which yields

$$dQ_d[f''(Q_d)q_d + f'(Q_d) + f'(Q_d)/N] - dC'(x) = 0 \tag{8}$$

and

$$P^* ds - dC'(x) = 0 \tag{9}$$

Equation (8) follows from the fact that $dq_d = (1/N)dQ_d$ for given N. Thus solving (8) and (9) we get

$$dx/ds = P^*/C''(x) > 0 \tag{10}$$

$$dq_d/ds = \{1/f'\}\left\{\frac{P^*}{(E+N+1)}\right\} \tag{11}$$

[4] $E = Q_d f''/f'$ and because $f'<0$, $E>0$ implies $f''<0$ so that the slope of the demand curve is becoming more and more negative, that is, the demand curve is concave. $E<0$ for a convex demand curve (Seade, 1980).

And since $x=q_d+q_f$, differentiating and using (10) and (11) we get

$$dq_f/ds=\frac{P^*(E+N+k)}{C''(E+N+1)} \tag{12}$$

Thus an increase in the subsidy rate will lead to an increase in the output produced by the firm as evident from (10). The effect on domestic sales and exports is determined by the sign of $(E+N+1)$. From the definition of E, $E+N+1$ is always positive for a straight line or a concave or a constant elasticity of demand curve with the elasticity of demand being greater than $1/(N)$, and therefore, domestic sales of each firm declines with subsidy and its exports increase. But in general, for convex demand curves we need to impose the restriction

$$E+N+1>0 \tag{13}$$

for firm's domestic sales to decline with subsidy which obviously is a stronger condition than the second order condition given by (7'). The Ruffin condition, namely $(E+N)>0$ or $(q_d f''+f')<0$ implying that at the point of equilibrium the marginal revenue curve is steeper than the demand curve is sufficient for a firm's domestic sales to decline and exports to increase with a higher subsidy. The aggregate output produced, total domestic demand and total exports can be calculated by using the symmetry equilibrium conditions. Thus

$$X=Nx \tag{14}$$

and hence, $dX/ds=N\ dx/ds$ so that we get using (10),

$$dX/ds=NP^*/C''(x)>0 \tag{15}$$

Similarly,

$$dQ_d/ds=Ndq_d/ds=N\{1/f'\}[P^*/(E+N+1)]<0 \tag{16}$$

and

$$dQ_f/ds=N[P^*/C'']-N\{1/f'\}[P^*/(E+N+1)]>0 \tag{17}$$

RESULT 3: *If* $(E+N+1)>0$, *which is weaker than the Ruffin condition,* $dx/ds>0$ *from* (10), $dq_d/ds<0$ *from* (11) *and* $dq_f ds>0$ *from* (12). *Also a higher subsidy rate will raise total industry output, reduce aggregate domestic sales and raise aggregate exports.*

II.2. *The Effects of Entry on Exports*

Let us now consider the effect on exports of a policy of encouraging entry through removal or relaxation of *licensing requirements*. For analysing the effects of entry on exports we differentiate (14) totally to get,

$$dX=Ndx+xdN \tag{18}$$

Since there is no change in the level of subsidy there will be no change in the export price facing firms and hence no price induced change in output. The output

of each firm will remain unchanged. So (18) can be written as

$$dX = x\,dN \tag{19}$$

Differentiating the first order condition (3) w.r.t N we get,

$$q_d f'' dQ_d/dN + f' dQ_d/dN + f'\, dq_d/dN - C'' dx/dN = 0 \tag{20}$$

Since $dx/dN = 0$ and $dQ_d/dN = q_d + N\, dq_d/dN$, substituting these values in (20) we can write

$$\eta_{qn} = -\left[\frac{E+N}{(E+N+1)}\right] \tag{21}$$

where η_{qn} is the elasticity of firms's domestic sales to entry and E is the elasticity of the slope of the domestic demand curve as defined above. The sign of (21) is negative if the Ruffin condition is satisfied so that *firm's domestic sales decrease with entry* into the industry. In the case of a closed economy the condition for stability ensures that a firm's domestic sales will decrease with entry. But not so in the case of an open economy since $E+2N$ may be positive even though $E+N<0$ if N is large enough. Since the level of output of the firm is unaffected by entry, exports by the firm must increase. As can be seen

$$v_{fn} = (N/q_f)(dq_f/dN) = \left(\frac{E+N}{E+N+1}\right)(q_d/q_f) > 0 \tag{22}$$

The effects of entry on aggregate domestic sales and exports can be seen from the following equations:

$$dQ_d/dN = q_d/[E+N+1] > 0 \tag{23}$$

$$dQ_f/dN = q_f + q_d\left[\frac{E+N}{E+N+1}\right] > q_f \tag{24}$$

RESULT 4. *Provided the Ruffin condition is satisfied, domestic sales of the firm will decrease with entry and as a consequence the exports of the firm will increase. Furthermore, domestic industry sales would increase, so that domestic price falls, and total industry exports will rise.*

Differentiating (24) w.r.t N again we get

$$d^2Q_f/dN^2 = dq_f/dN + \left[\frac{E+N}{E+N+1}\right] dq_d/dN + q_d d/dN\left[\frac{E+N}{E+N+1}\right] \tag{25}$$

If the Ruffin condition is satisfied then the sum of the first two terms of (25) is positive. $dE/dN > -1$ is a sufficient condition for the third term to be positive and so for $d^2Q_f/dN^2 > 0$, namely, entry to have an increasing effect on total

exports.[5] For a straight line demand curve $E=0$ so that $dE/dN=0$ and $d^2Q_f/dN^2>0$. For a constant elasticity of demand curve E is constant and hence $dE/dN=0$ so that again $d^2Q_f/dN^2>0$.

Similarly, differentiating (17) with respect to s we get,

$$d^2Q_f/ds^2=-(NP^*/C''^2)dC''/ds+NP^*[\{f'dE/ds+NP^*f''/f'\}/\{f'(E+N+1)\}^2] \tag{26}$$

On the rising segment of a U-shaped marginal cost, marginal cost is rising faster and faster so that $d^2(C')/dx^2>0$, namely $C'''>0$[6] and hence the first term of (26) is negative. In the second term the denominator is positive but the numerator involves the third derivative of the demand function which has no economic significance. However, for a straight line or a constant elasticity of demand $dE/ds=0$. Also in these cases $f''\geq 0$, so that the second term is non positive. But we do not get any unambiguous result for other more general types of demand functions. This result is in contrast to the previous results where an increase in the number of firms leads to an accelerating increase in exports. So we get the following result:

RESULT 5. *For certain types of demand functions, the Ruffin condition is sufficient for entry to have an accelerating effect on exports. On the contrary, in these cases for cost functions satisfying the condition* $C'''>0$ *a subsidy has a diminishing effect on exports.*

From Result 5 we can see the relative efficacy of a policy of encouraging entry in comparision with a policy of subsidization in promoting exports. Whereas entry is likely to have an accelerating effect on exports, a subsidy is likely to have a decelerating effect.

III. RELATIVE COST OF SUBSIBY AND ENTRY

Suppose the policy makers are interested in minimizing the subsidy cost for a given increase in exports which can be achieved either by raising the rate of subsidy or by allowing entry. If initially a subsidy was given for exporting then the subsidy costs will increase in either situation, namely, increasing the rate of subsidy or

[5] Differentiating the third term in (25) we get

$$\frac{d}{dN}\left[\frac{E+N}{E+N+1}\right]=\frac{dE/dN-1}{(E+N+1)^2}$$

which is positive if $dE/dN>-1$. It is diffcult to devise a general sufficient rule so that $dE/dN>-1$, since dE/dN involves the third derivative of the demand function and it is difficult to a priori place any restriction on the third derivative. But for important classes of demand curves, straight line or constant elasticity, $dE/dN>-1$. Therefore, dE/dN would continue to be greater than minus one for demand functions which deviate only slightly from the above classes of demand functions.

[6] C''' will be positive if the marginal cost function is strictly convex function and is sufficient for the local maximum of the function $Q_d=Q_d(N)$ to be a global maximum. (See, Theorem 5, Ruffin, 1971).

allowing new entry. Let us assume that the total subsidy cost is given by[7]

$$S=(sP^*q_f)N \tag{27}$$

Totally differentiating (27) we get

$$dS=(sP^*q_f)dN+(NsP^*)dq_f+(Nq_fP^*)ds \tag{28}$$

From equation (28) we get the two expressions showing the effects on subsidy costs of increasing subsidy or entry as

$$\begin{aligned} dS/ds &= (NsP^*)dq_f/ds + Nq_fP^* \\ &= sP^*dQ_f/ds + Nq_fp^* \end{aligned} \tag{29}$$

Similarly,

$$\begin{aligned} dS/dN &= sP^*q_f + (NsP^*)dq_f/dN \\ &= sP^*\{q_f + Ndq_f/dN\} \\ &= sP^*dQ_f/dN \end{aligned} \tag{30}$$

If we assume subsidy equivalent of entry as the same increase in exports whether by raising the subsidy rate or by allowing entry, that is,

$$dQ_f/dN = dQ_f/ds \tag{31}$$

then substracting (30) from (29) we get

$$dS/ds - dS/dN = P^*q_fN = P^*Q_f > 0 \tag{32}$$

RESULT 6. *An increase in the subsidy rate is more expensive than allowing entry for achieving the same increase in exports. The relative cost disadvantage of raising the subsidy rate increases the larger is Q_f, the existing volume of exports.*

IV. EXTERNAL VS. INTERNAL LIBERALIZATION AND WELFARE IN A GENERAL EQUILIBRIUM MODEL

In this section we show that under the given assumptions a policy of entry is also welfare superior to a policy of subsidizing exports. We assume that the economy can produce two goods, namely, X which is exportable and Y which is importable. Since the Y industry is protected by a tariff and the X industry is not perfectly competitive, there are two types of deviations from optimality—the domestic rate of transformation is equal to neither the international nor the domestic price ratios. Thus increasing competition in X industry through freer entry would reduce the second distortion while a subsidy to the X industry would bring the domestic rate of transformation closer to the international price ratio.

[7] The analysis can be conducted using an implicit function where $Q_f = Q_f(N,S)$. Since we have explicit results for changes in the subsidy rate and number of firms in the industry we have chosen the explicit method rather than the implicit function approach.

A similar change could as well have been achieved in a two good model by reducing the tariff on the import good. The former factor resulting in the shift in the relative prices closer to the domestic transformation rate may be called internal liberalization, the latter factor may be termed external liberalization.

Let

$$E(P_x, P_y, W) \tag{33}$$

be the expenditure function for the economy where P_x is the domestic price of the good produced by the X industry and P_y is the price of Y good and W is an index of welfare. Denoting domestic consumption of good x as Q_x and of good Y as Q_y, we have by the usual properties of the expenditure function,

$$Q_x = E'_x(.) \quad \text{and} \quad Q_y = E'_y(.) \tag{34}$$

where E'_x and E'_y are the partial derivatives of the expenditure function with respect to P_x and P_y. The technological conditions in industry X are summarized by a cost function which we can write generally as $c(w, x)$, with w standing for the vector of factor prices. Since X is the export industry and Y is the import industry we can write

$$X = Q_x + Q_f \tag{35}$$

and

$$Y = Q_y - M_y \tag{36}$$

Q_f and M_y are the trade flows. Then from the basic assumption of income-expenditure equality we can write

$$E = (P_x - c_x)Q_x + \{P_x^*(1+s) - c_x\}Q_f + (P_y - c_y)Y + (P_y - P_y^*)M_y - sP_x^*Q_f + \sum wv \tag{37}$$

where $*$ implies world prices, c_x and c_y are the average costs in X and Y industries and w and v are the factor price and cost minimizing input requirement vectors respectively. The above formulation assumes that tariff proceeds are given back to the consumers in a lump sum manner and subsidies paid to the producers are financed by taxation in a non-distortionary manner. We assume perfect competition and constant costs in Y industry so that $P_y = c_y$ and equation (37) becomes

$$E = (P_x - c_x)Q_x + \{P_x^* - c_x\}Q_f + (P_y - P_y^*)M_y + \sum wv \tag{38}$$

Differentiating (38) totally and assuming

(i) $dP^* = 0$, i.e., country faces fixed foreign prices;
(ii) $P_y^* dM_y = P_x^* dQ_f$, i.e., the policy change has no effect on trade balance;
(iii) $P_x^*(1+s) = MC$ where s is the rate of subsidy;
(iv) $\theta = \dfrac{d(c_x x)/dx}{c_x}$ where θ is the ratio of MC to AC. and $\theta \gtreqless 1$ depending on

increasing, constant or decreasing returns to scale, we get

$$E_w dW=(P_x-c_x)dX-Xdc_x-\{P_x-P_x^*(1+t_y)\}dQ_f \tag{39}$$

since $Xdc_x=(\theta-1)c_x dX$ we can write (39) as

$$E_w dW=(P_x-MC)dX-\left\{P_x-MC\frac{(1+t_Y)}{(1+s)}\right\}dQ_f \tag{40}$$

Therefore,

$$E_w dW/ds=(P_x-MC)dX/ds-\left[P_x-MC\frac{(1+t_Y)}{(1+s)}\right]dQ_f/ds \tag{41}$$

Since we know from (15) and (17) that $dX/ds<dQ_f/ds$, the sign of the expression (41) is unambiguously negative if $s\geq t_y$.[8] However, if $s<t_y$ then dW/ds may be positive.

RESULT 7. *If the rate of subsidy is equal to or greater than the prevailing rate of tariff on the other commodity, welfare decrease is unavoidable. If however, the subsidy rate is less than the tariff rate then welfare may also increase as a result of subsidization.*

An intuitive economic explanation to Result (7) can be given as follows. A first best equilibrium for a two good open economy is characterized by the following equalities

$$MRS=MRT=FRT$$

where MRS is the domestic marginal rate of substitution in consumption, MRT is the domestic marginal rate of transformation in production and FRT is the foreign rate of transformation. For the economy in our model, $FRT=P_x^*/P_y^*$, $MRT=P_x^*(1+s)/P_y^*(1+t_y)$. Also $MRS>MRT$ as the domestic price of good x is higher than its marginal cost because of the oligopolistic product market. If $s>t_y$, then

$$MRS>MRT>FRT$$

Since $MRT>FRT$, more of the exportable good X is being produced than would have been produced in the optimum equilibrium and the increased price of good X lowers its consumption below what would prevail in the optimal equilibrium. An increase in the subsidy rate raises the domestic price of and as a result the production of good X and reduces its domestic consumption. Increasing the subsidy rate drives MRT further away from FRT and even more of the good X is being produced. Also domestic price of good X increases means that MRS rises and consumption of good X is further curtailed. Therefore, the increase in the subsidy rate when $s>t_y$, drives MRS and MRT further away from FRT. If $s<t_y$, then

[8] In equations (17) and (24) since there was no ambiguity the subscript 'x' had been dropped.

raising s lowers the gap between MRT and FRT. Whether MRS is greater or less than FRT depends on the degree of monopoly power. If the degree of monopoly power is sufficiently low then $MRS < FRT$ and raising s would reduce the gap and welfare would rise. However, if degree of monopoly power is high then $MRS > FRT$ and increasing the subsidy rate would drive MRS further away from FRT and increase this distortion and welfare may increase or decrease.

Let us consider equation (40) in the case of domestic industrial liberalization. Since the rate of subsidy remains unaffected equation (39) becomes

$$E_w dW/dN = (P_x - MC)dX/dN - \{P_x - P^*_x(1+t_y)\}dQ_f/dN \tag{42}$$

As in case of entry $dx = 0$,

$$E_w dW/dN = (P_x - MC)x - \left\{P_x - MC\frac{(1+t_y)}{(1+s)}\right\}dQ_f/dN \tag{43}$$

From equation (24) $dQ_f/dN < x$, so that for $s \leq t_y$ dW/dN is positive. However, if $s > t_y$, then dW/dN may be negative.

RESULT 8. *The effects of entry on welfare will be positive if the rate of subsidy is equal to or less than the rate of tariff. On the other hand, if the rate of subsidy is greater than the rate of tariff then entry may lead to decrease in welfare.*

With entry, production of good X increases as also its domestic consumption and domestic price of good X decreases. The increase in domestic production and the reduction in domestic price reduces the excess price over marginal cost in the production of good X and so reduces the distortion from the oligopoly in the market for good X. Furthermore, if $s < t_y$, the higher production of good X shifts the production point closer to the optimal one. On these two counts welfare improves. If $s > t_y$, then too much of X is being produced and entry would further increase output of good X so that the production distortion would increase. But welfare would still improve because of reduction in oligopoly power in the market for good X and, therefore, aggregate welfare may improve or worsen.

To compare changes in welfare in case of subsidy with that in case of entry we consider as before the entry equivalent of subsidy, namely, $dQ_f/ds = dQ_f/dN$.[9] Then substracting (43) from (41) we get

$$(E_w dW/dS - E_w dW/dN) = (P_x - MC)dX/ds - \left\{P_x - MC\frac{(1+t_y)}{(1+s)}\right\}dQ_f/ds$$

$$-(P_x - MC)dX/dN + \left\{P_x - MC\frac{(1+t_y)}{(1+s)}\right\}dQ_f/dN \tag{44}$$

As we compare the welfare levels for the same increase in exports, that is, $dQ_f/dN = dQ_f/ds$.

[9] Here also the analysis could have been conducted using an implicit function.

$$(E_w dW/ds - E_w dW/dN) = (P_x - MC)dX/ds - (P_x - MC)dX/dN$$
$$= (P_x - MC)(dX/ds - dX/dN) \quad (45)$$

From the equality of $dQ_f/ds = dQ_f/dN$ we get from equation (17) and (24)[10]

$$q_f + \frac{E+N}{E+N+1} q_d = NP_x^*/C'' - \{N/f'\}[P_x^*/(E+N+1)]$$

Or

$$q_f + \frac{E+N}{E+N+1} q_d + \{N/f'\}[P_x^*/(E+N+1)] = NP_x^*/C''$$

The L.H.S. is less than x and we know that $dX/dN = x$ and R.H.S is dX/ds therefore

$$dX/ds < dX/dN \text{ so that } E_w dW/ds < E_w dW/dN.$$

RESULT 9. *For the same increase in exports welfare will be unambiguously higher if the increase in exports is brought about by entry of additional firms than if it is brought about by increasing subsidization.*

V. CONCLUSION

We developed a model for studying an oligopolistic segmented market for a small open economy. We derived the characteristics of the equilibrium in such a market. In equilibrium all scale economies would be exploited and firms would produce on the upward sloping segment of the marginal cost curve. Also, in contrast to the results of an oligopoly equilibrium in a closed economy, all firms which export will sell equal amounts in the domestic market irrespective of their cost differences and the more efficient firm will export a larger proportion of its output. The conditions for stability of the equilibrium are also weaker for an open economy equilibrium than for the closed economy case.

We use the model to analyse the importance of a country's industrial policies for export performance and welfare. Both internal liberalization through freer entry and external liberalization through a subsidy lead to greater exports. The effect of freer entry and export subsidies can be compared in a number of different ways. A subsidy is likely to have a diminishing effect on exports. Entry is likely to have an increasing effect. Therefore, entry is more effective in increasing exports in the longer run than the export subsidies. Furthermore, for the same increase in exports entry requires a smaller increase in the government's expenditure. Therefore, since governments in LDCs are facing large budget deficits, entry would be a preferable way to raise exports. Also though each policy directly narrows only one distrortion the subsidy narrowing the distortion between the international rate of transformation and the domestic rate of transformation while entry reduces

[10] See footnote 8.

the difference between the domestic rate of transformation and the marginal rate substitution facing consumers, internal liberalization has been shown to be welfare superior for the same increase in exports.

The above analysis however does not tackle the question of whether additional entry into the industry would actually occur. The implicit assumption is that firms are keen to enter but are prevented by the licensing authorities. Our analysis does not also discuss the question of whether dimunition of monopoly power as a result of entry of new firms will reduce inventive activity in the long run. However, if technical changes are brought out by imitation rather than by deployment of large resources in late industrializing countries (Amsden, 1989), then the reduction of profits may not seriously affect the pace of adoption of existing technology.

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